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CONTENTS

A History of Rice and Corn Improvement in the Philippines . .	*L. B. Uichanco*	283
Combining-Ability Test of College White Flint Inbred Lines . . .	*Ibarra S. Santos*	290
Aurofac as a Supplement to the College Growing Ration for Chicks	*Marcelo V. Catalan*	295
The Marketing of Duck Eggs In Morong, Pasig, and Pateros, Rizal .	*Nathaniel B. Tablante and Melchor F. Constantino*	303
Heart Rate, Respiration, and Body Temperature of Berkjala Swine	*Faustino S. Mensalvas and Miguel P. Palao* . . .	310
Consumer Preferences and Retail Purchases of Poultry and Eggs of 300 Households in Naga City.	*Nathaniel B. Tablante and Corazon P. Salamat* . . .	317
College and Alumni Notes	. . . . .	322
Staff of the College of Agriculture and Central Experiment Station, University of the Philippines, Los Baños, in the Second Semester of the School Year 1952-1953 . .	. . . . .	324

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A HISTORY OF RICE AND CORN IMPROVEMENT IN THE PHILIPPINES [1]

L. B. UICHANCO [2]

It seems fitting that in the Philippines, where, in spite of Kipling, the West meets the East on common ground, we should deal with rice and corn together. These two crops represent the origins of two of the world's four basic civilizations. The civilization of rice developed in the Eastern Hemisphere, in humid tropical environment, at about the beginning of the Christian era, the first indication of culture being some 1000 to 500 years B. C. Its center was in southeastern China, Indonesia, and Bengal (Spinden).[3] The civilization of maize developed much earlier, sometime after 5000 B. C., in the arid subtropical highlands of Central America. It should be pointed out that the American plant is more highly domesticated than the Asiatic and, hence, is better adapted to a wider range of climate.

The first waves of Indo-Malayan settlers apparently reached the Philippines early in the development of the civilization of rice. Each settler's boatload unit, or *barangay*, presumably took along as an essential provision a supply of seed rice for planting in the new home. When Magellan discovered these islands in 1521, Pigafetta,[4] the chronicler of the voyage, noted that among the natives "i vegetabili sono riso, miglio, panico, etc." (the plants were rice, millet, panicum, etc.).

Rice, as the staple food, has always been the premier crop in the Philippines. Among Filipinos in general, to eat no rice is to eat nothing. Cooked rice (*kanin, kanon, nassi, inapoy*) is regarded almost with reverence. A morsel accidentally dropped on the floor is promptly removed and disposed of, lest the gift of God be stepped on and desecrated. Perhaps no other calling is so steeped in time-honored tradition and ancient lore as that of the rice farmer, and the following lines describe the situation quite aptly: [5]

> Years have carved their telling changes
> In his custom-hallowed ways,
> Crowding fast to cruel oblivion
> All his bonds with older days.

---

[1] General Contribution No. 860. Read before the rice and corn improvement training school, U. P. College of Agriculture and Central Experiment Station at Los Baños.

[2] Dean, College of Agriculture, and Director, Central Experiment Station, Los Baños.

[3] SPINDEN, H. J. 1927. The prosaic vs. the romantic school in anthropology. Culture. Norton.

[4] Pigafetta, Antonio de. 1521. Primo viaggio intorno al mondo. Blair & Robertson.

[5] Philippine Prose and Poetry, vol. 2.

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But he toils in prime contentment,
Breaking hard resisting clods,
Sowing faith across the ages
In deposed, forgotten gods.

Feels he then the joy of living
When he puts the seeds to bed,
Each with love to deftly nurture
Till it lifts its golden head?

As his fathers did before him,
Keeps he at his wonted pace
In a nation-wide rehearsal
The tradition of his race.

Events in this country prior to Spanish occupation largely belong to prehistory and much has to be left to conjecture, not because the ancient Filipinos left no writings, but because the manuscripts they left behind were ruthlessly burnt to clear the ground for a pure culture of the Christian religion. For instance, Father Chirino [6] writes early in the seventeenth century that in one town in Batangas alone not less than three hundred manuscripts in ancient Tagalog writing were destroyed. Also, the climate and vermin of the country have not been conducive to long preservation of documents. The terrible destruction of the last war supplied the finishing touches.

During the Spanish regime, powerful forces were at work against the economic development of the country. In addition to hostile raids by bandits, by Chinese and Moro pirates, and by rival European colonists, notably the Portuguese, Dutch, and British, the annual voyages of the galleon between Manila and Acapulco from 1593 to 1815 served to incline the interest of the royal officials to the lucrative monopolistic traffic of goods between the China coast and Mexico. Through this means, they had a chance to make a fortune without all the work involved in agricultural pursuits. Hence, most of the Spaniards gravitated to Manila and none would stay in the provinces. It should be mentioned that in this galleon trade, no Philippine produce was handled, the Philippines serving merely as the trade center between Oriental countries and Mexico.

The Sociedad Economica de los Amigos del País, which was inaugurated in 1782 under Governor Jose Basco y Vargas and which lasted until 1890, was the first to attempt the development of the country's natural resources, but it concerned itself only in such crops as cotton, spices, sugar, coffee, indigo, guttapercha, silk, hemp, and cacao, and apparently not in rice or corn. For that matter, the only crop in which the government really interested itself was tobacco, mainly as a consequence of the government's tobacco monopoly and the revenue which this crop brought to the treasury. Whatever improvement, therefore, that was brought about in rice culture until

[6] CHIRINO, PEDRO. 1604. Relacion de las islas filipinas. Rome. Blair & Robertson 12: 13.

early in the present century was the result of the individual efforts of the Filipino farmers themselves.

Father Zuñiga,[7] writing in 1800, reports that in Pampanga rice is so very abundant that it is harvested four times a year, although not in the same place. It is harvested twice in the same place if the land is irrigated and there are sufficient police to keep away the animals. In unirrigated land, the crop is harvested once and then followed with indigo or corn. Rice requires much water and takes six months to mature; corn, not much water and is harvested in two months. Successive cropping, however, can not often be done because carabaos are pastured in the field after harvest. Of the four harvests in different places, the earliest is on higher lands, where the rice is planted in May and harvested in September. Because of absence of floods, harvest on these lands is the surest, but the yield is variable and small when there is too much rain. The second harvest is made on land that is flooded by rivers. Planting is done in June so that the plants are high enough to withstand the rise of water in July. The third crop is the most common in the Philippines but is limited in Pampanga because most of the land is low. Planting is done in September and harvesting in January. The fourth planting is made on very low lands which become veritable lakes in August. These are prepared and planted as soon as the water subsides. The same author gives the rice yield in Biñan, Laguna, as fifty to sixty cavans to a cavan of seed. The harvest was so much in some parts of the country that rice was at one time an export commodity after Sual, in Pangasinan, had been opened as a port in 1855.

Retana,[8] on the authority of Father Blanco, gives Binambang as the most common lowland variety at the time. Kinanda was the most commonly planted upland variety in Batangas because, in addition to tasting well, the grains swell more on cooking. Retana also noted Malagkit (glutinous rice), which is used for special cooking and is given to horses to expel parasitic roundworms; Buntot Cabayo, which is a lowland rice in the Ilocos provinces but is upland in Batangas; Dumali, a three-month variety; and Lamuyo, which is planted along the coasts. The same varieties were reported earlier by the American, Commodore Wilkes, whose expedition visited the Philippines in 1842.

There are doubtless many minor varieties that have not been recorded in the literature. These, especially the upland forms, are frequently extremely local in occurrence, farm families keeping their own stocks of seeds that are handed down for generations. They have been kept relatively pure and distinct varieties because rice is normally self-pollinated, with natural hybridization occurring from time to time and giving rise to additional new varieties. That

[7] ZUÑIGA, MARTINEZ DE. 1803. Estadismo de Filipinas. *Edited by* W. Retana. Madrid.

[8] ZUÑIGA, MARTINEZ DE. 1893. Notes by the editor in vol. 2.

a number of these older varieties have not deteriorated but have in certain cases probably been improved has been because mass selection is a common practice of the rice farmer. At harvest time the yield from some of the best-looking parts of the field are saved as *binhi*, or seed. When the field is small and only a small amount of seed is needed, the whole heads are done up in convenient bundles and hung from the ceiling over the kitchen stove, where the smoke and some heat help preserve them for the next planting.

New varieties must have also been continuously introduced since before Magellan's time, when the Philippines enjoyed commercial intercourse with China and other Oriental countries. The Spanish friars, who maintained missionary outposts in India, Japan, China, and other Oriental countries, must have contributed a no mean part in bringing in new varieties. A story is current in Calamba, Laguna, that sometime in the 1920's, shortly after the first world war, Mrs. Teodora Alejar Alcaraz, a rice dealer, sorted out a bare handful of rough rice from her stock of milled glutinous rice from China. She planted the seeds and kept on multiplying them until she had a seed supply large enough for field planting on her farm. This was said to be the origin in this country of Malagkit Sungsong (Chinese glutinous rice), which has since proved to be one of the most popular varieties because of its high yield and superior quality. Since the American occupation, many new varieties have been introduced mainly through the efforts of the Bureau of Agriculture and its successor, the Bureau of Plant Industry, as well as this College. Some of these new varieties have proved superior to the old ones and have replaced them in popularity.

Scientific rice breeding and selection in the Philippines was not undertaken until after the first decade of the present century. For that matter, plant breeding in the modern sense had not begun much earlier anywhere else, for the reason that the basic tools did not become extant until the rediscovery of Mendel's law at the turn of the century and the unearthing of the proofs by Morgan and his associates about the fundamental role of chromosomes in heredity. Capinpin [9] has written a convenient summary of the work covered from 1914 to 1933, where he gives the earliest worker as H. O. Jacobson, of the Bureau of Agriculture. Other contributors were Goco, Romero, Peralta, Mercado, who worked as thesis students under Dean C. F. Baker, of the College of Agriculture, and Mendiola, Capinpin, Mercado, Calma, Aragon, Montemayor, and others of the same institution. Among the investigators in the Bureau of Plant Industry were Torres, Unite, Rodrigo, Borja, and Octubre. The work consisted of line selection, mass selection, variety tests, introduction and adaptation of additional foreign varieties, hybridization, and allied activities. One striking result was the improvement in yield through line selection of strains of Elon-elon and Seraup Kechil 36,

[9] CAPINPIN, JOSÉ N. 1935. History of plant breeding in the Philippines. National Research Council of the Philippine Islands Bull. No. 5: 457–471.

which increased production to from 30 to 50 per cent over the parent stocks. Mass selection in eleven rice varieties planted one plant to the hill resulted in an increase in yield of from 25 to 100 per cent, although in some cases a decrease of 12 to 34 per cent obtained.[10] The Raminad strains, which are hybrids of Ramai and Inadikha and which include Quezon rice, were produced by the Bureau of Plant Industry; Ramelon was produced by the same bureau, and Elon-ram, by the College of Agriculture. The last two strains are hybrids of Elon-elon and Ramai. The increase in yield of Elon-ram over either parent was from 50 to 60 per cent.[11]

At this juncture, the work of the Central Rice Research Institute of the Food and Agriculture Organization of the United Nations at Cuttack-Orissa, India, might be mentioned as giving promise of being of immense value to the Philippines, among other Oriental countries. The rice varieties grown in temperate and subtemperate latitudes fall under subspecies *japonica;* they are generally high yielders but are ill-adapted to tropical conditions. It should be explained that one important contributing factor to high yield is the long total daylight obtaining during the growing period in the higher latitudes. On the other hand, rice varieties of the tropics, which are of the subspecies *indica,* are low yielders. During the Japanese occupation serious attempts were made to grow in the Philippines the Formosan Horai rice varieties. Extensive areas were planted and the fields were given very special treatment as to preparation, cultivation, and irrigation. Not a single Horai rice variety has survived in the Philippines from this introduction, however; the attempt failed because Horai rice is of the subspecies *japonica.* At Cuttack, large-scale attempts are being made to produce hybrids that will combine the high yield of *japonica* and the tropical adaptability of *indica.*

Corn is relatively a newcomer in the Philippines. Reference to the finding of this plant when Magellan landed in the Philippines was the result of a poor and inaccurate early Spanish translation of Pigafetta's chronicle in Italian. The seed was probably brought to the Philippines in this and subsequent Spanish expeditions, even before the final occupation of the islands by Legaspi in 1565. For instance, when Ruy Lopez de Villalobos was sent from Mexico in 1542 to colonize this country and establish the Christian religion, he was driven by the winds to the island of Sarangani, south of Mindanao, where he found the inhabitants hostile. In the resulting battle, he got possession of a hill where he and his men stayed long enough to plant maize, which yielded abundant crops, before he set sail and fell into the hands of the Dutch in the Moluccas. Of the different varieties, almost all that have survived are the hard flint types, either yellow or white or, occasionally, purple. Certain other varieties, like the glutinous type Lagkitan, are sometimes grown. Re-

[10] *Ibid.,* p. 45–46.
[11] Philippine Agriculture, vol. 1. 1949. p. 49.

gional strains have developed in various parts of the Philippines because of prolonged isolation.

Except in such places as the Ilocos provinces and Cebu, corn has played a very small part in Filipino human dietary. It is often used only to supplement rice. White corn is preferred to yellow because when it is ground and added to rice, neighbors may not see that the family has become too hard up to buy rice. Consequently, cost has been used mainly as a minor crop, usually in succession to rice. Around 1910 the Bureau of Education undertook an extensive program, through the public schools, of popularizing corn as human food. Unfortunately, most of the products demonstrated were such items as corn bread and cakes, which are not habitually the main part of the people's diet, and therefore no lasting effects resulted from the attempt.

As a rule, seed selection is practiced by the farmer. Corn for seed, however, is not usually selected from the standing crop in the field, as it should be; instead, the biggest and well-filled ears are picked out from the pile. Seeds from the middle portion of the ear, but not those at the base and the butt, are planted because it is believed that the middle seeds produce better corn plants. Experiments conducted in this College [12] have shown that the position of the kernels on the ears bears no relation to the yield of the plants developed therefrom, although the highest percentage of germination is shown by seeds from the middle portion.

The earliest recorded work on hybridization in this country, in an effort to increase production through hybrid vigor, appeared in a paper by Mendiola in 1914.[13] By crossing Yellow Flint with White Dent, White Flint with Yellow Dent, White Flint with Yellow Flint, and White Dent with Yellow Dent, an increase in yield ranging from 7 to 75 per cent over the parent varieties was realized.[14] Unfortunately, double crossing was not practiced prior to the war. Without this ingenious method of considerably multiplying the stock of hybrid seed to make its utilization economically possible, no practical use was made of the findings until after the end of the last world war, when Calma, Capinpin, and Umali made serious attempts in this direction. Because of the extensive commercial use of hybrid seeds produced from double cross in the United States since the last war, it was thought that a short cut might be made by importing seeds from American business firms which specialize in this work. The trials so far have not proved any too encouraging. The American hybrid seeds showed a high percentage of germination and the initial growth, indeed, looked vigorous and promising. However, the seedlings apparently could not stand local conditions and they were rapidly decimated by disease when they were still very small. Hence,

[12] A Handbook of Philippine Agriculture. 1939. p. 44.

[13] MENDIOLA, N. B. 1914. Hybridization of corn. Philippine Agriculturist 3: 165–171.

[14] A Handbook of Philippine Agriculture. 1939. p. 37. *See also* p. 38 and 39.

the only alternative left is to develop our own hybrid combination locally from better-adapted material. For that matter, efforts at introducing into this country seeds from the United States, not only of sweet corn and popcorn, but also of the flint types, have not been very successful, except occasionally on the first harvest. An introduction worthy of note, however, which was first brought here sometime before the last war, is what has come to be known as the Cuban Yellow Flint. It was developed at the Cuban agricultural experiment station, under tropical conditions, by Doctor Del Valle, and it has proved well-adapted and very productive in the Philippines.

In the present discussion, I purposely omitted or only incidentally touched on the improvement of yield through improved cultural practices, the recent developments in weed control, particularly on rice, through the use of new chemicals, the use of new and more effective insecticides and fungicides, and the rapidly spreading popular consciousness about the utilization of commercial fertilizers, irrigation, and other means that help to enhance production.

With the coming of the PHILCUSA-MSA aid to this country, the program of promoting Philippine agriculture is being rapidly revitalized and strengthened at a pace and to an extent hitherto unknown here. The present gathering, which brings together the principal workers on plant breeding in the Department of Agriculture, this College, and other government units under the leadership of Prof. H. K. Hayes, is a significant milestone in the implementation of this program. It is particularly heartening that we have Professor Hayes to spearhead this work. He is one of the pioneers in the development of the hybrid corn seed program in the United States and his basic contributions over a period of forty years have closely identified him with the science of plant breeding, of which he is one of the world's most outstanding leaders.

COMBINING-ABILITY TEST OF COLLEGE WHITE FLINT INBRED LINES [1]

IBARRA S. SANTOS

Twenty S_3 lines of College White Flint corn inbreds selected from 105 inbred lines developed by the Division of Plant Breeding, Department of Agronomy, for their good agronomic characters were tested for their combining ability with Bicol White Flint. Two inbred lines were found to be good combiners. These were C103-1.1.1 and C117-1.2.2.

When many inbred lines of corn are available for the production of single crosses, double crosses, or synthetics, the breeder selects the more desirable inbreds by testing their general combining ability. A common method is crossing each inbred with a common tester or testers. In many such trials, unrelated varieties have been used to serve as one parent of the cross. Jenkins and Brunson (1932) presented the first study that showed the possibility of selecting for combining ability from a single test. It was, however, well-known before their work that some inbred lines excel in general combining ability.

A review of all the studies on combining ability would require a very extensive survey of literature. The findings of Johnson and Hayes (1936) and Hayes, Murphy, and Rinke (1943) may be cited as evidence that inbreds of high combining ability are more likely to produce better single or double crosses than inbreds of low combining ability.

This study was undertaken in the Central Experiment Station of the College of Agriculture and in the plant breeding laboratory of the Department of Agronomy from November, 1951, to February, 1953, to evaluate by the combining-ability test the performance in hybrid combinations of 20 College White Flint inbreds selected for plant, ear, and grain characters.

MATERIALS AND METHODS

Materials

Parental stocks. The S_3 inbred lines used in this study were developed from College White Flint by the Division of Plant Breeding, Department of Agronomy. Bicol White Flint, which had been previously found to perform well under Los Baños conditions, was used in the topcrosses.

Inbred lines. At tasseling time in July, 1951, fifty S_3 lines were chosen by ordinary visual selection from the 105 College White in-

[1] Central Experiment Station Contribution No. 1662. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Agronomy under the direction of Assistant Professor Dioscoro L. Umali. Prof. H. K. Hayes gave valuable suggestions in the preparation of the manuscript.

breds which were available. These 105 lines had been selected by the Department of Agronomy for general vigor, ability to retain green color until maturity, breadth and number of leaves, resistance to root and plant lodging, diameter of stalk, height of ear above the ground, ability to produce plenty of pollen, and resistance to diseases and insect pests.

At harvest time, only 20 lines were finally selected. Aside from the plant characters already described, the following characteristics were also used as basis in the final selection: well-covered ear, cylindrical shape of ear, length of ear, number of grain rows, well-filled ear, and freedom from damage by insects and diseases. The 20 inbreds finally selected for the topcrosses were C101-1.1.1, C101-3.1.1, C101-3.1.2, C102-1.1.1, C102-2.1.1, C103-1.1.1, C105-1.2.1, C106-1.3.1, C111-1.1.1, C111-1.4.1, C113-1.1.1, C113-1.2.1, C114-1.1.1, C116-1.3.2, C117-1.2.2, C121-1.2.1, C122-1.1.2, C125-1.1.1, C125-1.2.1, and C125-1.2.2. Their combining ability was determined by crossing each with Bicol White Flint, a variety distinctly different in many characters from College White Flint. It may be of interest to point out that better-combining inbred lines of College White Flint will be used eventually in crosses with high-combining inbred lines of Bicol White Flint.

Making the topcrosses

In November, 1951, a 30-hill row of each inbred was planted to serve as the female parent. For every two rows of inbreds, one row of the Bicol White Flint variety was planted as pollen parent. Eight ears of each inbred were hand-pollinated with the bulked pollen from several plants of the Bicol White Flint. The bulked grains from the ears of each topcross were used for the performance test.

Performance test of the topcrosses

Field plot design. The design used in this test was the balanced or symmetrical incomplete block as presented by Love (1943). To make the total number of entries 25 and to provide checks on the combining-ability entries, two entries of College White Flint, two of Bicol White Flint, and one of Lagkitan were included in the test. For 25 lines the design required six replications, five blocks to a replication, and five plots to a block. Numbers corresponding to the entries of the lines, the position of a line within a block, the blocks in a replication, and the replications in the field were used for the randomizations. Twelve hills, 50 centimeters apart, constituted a plot.

Planting. On May 28, 1952, the 20 topcrosses and the five open-pollinated varieties were planted, five kernels to a hill. Two weeks later, each hill was thinned to two plants. Guard rows were planted to keep the experimental plants surrounded by other corn plants.

Field observations. At tasseling time, observations on the following were made: (1) height of ear from the ground, (2) height

of plants, (3) number of leaves, (4) susceptibility to root and plant lodging, (5) resistance to diseases and insect pests, and (6) date of tasseling. The date of tasseling was noted when about one-half of the plants in a plot had tasseled. For each line, ten plants selected at random from the plot were measured.

Data taken after harvest. The harvested ears were dried to approximately sixteen per cent moisture before the shelling percentage and the grain yield were determined. The yield was based on the harvest of ten perfect-stand hills surrounded by other corn plants.

RESULTS AND DISCUSSION

In earlier years corn breeders usually tested the combining ability of inbreds only after the sixth generation of selfing. The conclusion, however, of Jenkins (1935) that inbred lines showed their individuality as parents in topcrosses in early segregating generations and remained relatively stable in later inbred generations led to the consideration of the value of testing the combining ability in the earlier generations of selfing. It must be recognized, though, that combining ability segregates in the same manner as other characters (Hayes, 1952). Singleton and Nelson (1945), who investigated further the conclusion of Jenkins, found that the potential combining ability of an inbred can be reliably recognized after three generations of selfing and that this ability will persist in most cases even though the selfing is carried on further; hence, S_3 lines were used in the present study.

Evaluation and selection of the S_1 or even the S_0 lines, according to Lonnquist (1950), are important only because one would be starting with more promising lines than when unselected materials are used. Recently, by using S_1 lines, members of the Rockefeller Foundation in Mexico introduced double crosses for commercial production.[2] And as Sprague and Tatum (1942) have found out, specific combining ability, which can be recognized only after Mendelian segregation, recombination, and various types of factor interaction have occurred, is more important than general combining ability in influencing the yield of specific crosses.

The inbreds were ranked according to their topcross yields (table 1). The first two lines whose topcrosses yielded significantly more at the 5 per cent point than College White Flint were C103-1.1.1 and C117-1.2.2.

The topcrosses of the first four lines produced more leaves than the College White Flint variety, but had about the same plant height and height of ear above the ground as College White Flint. Although C113-1.2.1 $\times$ Bicol was taller than the first four topcrosses, it had

[2] Information from Professor H. K. Hayes, professor of plant breeding and member of the Cornell University–U. P. College of Agriculture contract staff.

almost the same number of leaves but had a lower grain yield. C102-1.1.1 and C111-1.4.1 had high shelling percentages but low grain yields. These observations indicate that there is no simple, large, direct relation between any of the agronomic characters studied and grain yield.

The first four high-yielding topcrosses tasseled a little later than the average of the other topcrosses. While no conclusion can be made from the data on the relation of length of maturity to yield, it is generally believed that the longer the maturity, the greater is the yield.

No considerable damage from diseases and insect pests was observed in the topcrosses studied. A few corn borers,[3] *Pyrausta nubilalis* Hubn., attacked the plants, but the damage was evenly distributed among the lines.

The stand was excellent. Only a few plants showed plant- and root-lodging characteristics, and these were evenly distributed among the lines.

Although both varieties were about the same in plant height, height of ear above the ground, and yield, Bicol White Flint produced, on the average, more leaves to a plant than College White Flint. Lagkitan proved to be the lowest yielder.

LITERATURE CITED

HAYES, H. K., AND E. H. RINK. 1943. A comparison of the actual yields of double crosses of maize and their predicted yield from single crosses. Jour. Amer. Soc. Agron. 35: 60–65.

JENKINS, M. T. 1935. The effect of inbreeding and selection within inbred lines of maize upon the hybrids made after successive generations of selfing. Iowa State College Jour. Sci. 9: 429–530.

————, AND A. M. BRUNSON. 1932. Methods of testing inbred lines of maize in crossbred combinations. Jour. Amer. Soc. Agron. 24: 523–530.

JOHNSON, I. J., AND H. K. HAYES. 1936. The combining ability of inbred lines of Golden Bantam Sweet corn. Jour. Amer. Soc. Agron. 28: 246–252.

LONNQUIST, JOHN H. 1950. The effect of selection for combining ability within segregating lines of corn. Agron. Jour. 42 (10): 503–508.

LOVE, HARRY H. 1943. Experimental methods in agricultural research. 1st ed., v + 229 p. Rio Piedras, Puerto Rico: University of Puerto Rico Agric. Exper. Sta.

SINGLETON, W. R., AND O. E. NELSON, JR. 1945. The improvement of naturally cross-pollinated plants by selection in self-fertilized lines. Connecticut Agric. Exper. Sta. Bull. 490: 457–498.

SPRAGUE, A. F., AND L. A. TATUM. 1942. General v. specific combining ability in single crosses of corn. Jour. Amer. Soc. Agron. 34: 923–932.

[3] Identified by Dr. Getulio B. Viado of the Department of Entomology.

TABLE 1

Performance of the inbreds in topcrosses

LINE	MEAN HEIGHT OF PLANT	MEAN WEIGHT OF EAR FROM THE GROUND	MEAN NUMBER OF LEAVES	PLANTING TO TASSELING	SHELLING PERCENTAGE	YIELD [a]	YIELD IN PERCENTAGE OF C.W.F.
	cm.	*cm.*		*days*		*grams to a plant*	
C103–1.1.1 × Bicol	205.2 ∓ 7.4	115.6 ∓ 6.7	14.3 ∓ 0.5	52	81.15	141.92	126.58 [b]
C117–1.2.2 × "	204.8 ∓ 4.4	114.3 ∓ 3.6	13.8 ∓ 0.2	46	83.11	132.88	118.55 [b]
C113–1.1.1 × "	205.5 ∓ 4.6	113.3 ∓ 3.3	14.1 ∓ 0.4	47	81.15	129.12	115.17
C101–3.1.2 × "	196.9 ∓ 6.9	110.9 ∓ 4.2	14.5 ∓ 0.2	53	81.51	129.00	115.07
C105–1.2.1 × "	204.6 ∓ 6.9	115.4 ∓ 5.0	13.3 ∓ 0.2	50	84.21	121.72	108.55
C125–1.1.1 × "	186.3 ∓ 6.6	113.0 ∓ 5.5	13.7 ∓ 0.4	44	83.85	120.48	107.49
C101–3.1.1 × "	206.4 ∓ 8.2	116.9 ∓ 5.3	15.3 ∓ 0.4	46	84.57	120.12	107.14
C125–1.2.1 × "	214.9 ∓ 4.6	119.2 ∓ 4.7	14.5 ∓ 0.4	48	83.36	119.64	106.69
C101–1.1.1 × "	207.3 ∓ 5.2	119.4 ∓ 2.6	14.1 ∓ 0.3	47	83.47	119.44	106.51
C106–1.3.1 × "	207.1 ∓ 3.5	110.9 ∓ 2.3	13.7 ∓ 0.2	47	84.42	119.36	106.46
C111–1.1.1 × "	205.5 ∓ 6.0	120.1 ∓ 4.5	14.2 ∓ 0.2	48	81.87	118.60	105.79
C116–1.3.2 × "	195.5 ∓ 3.9	101.7 ∓ 4.9	14.3 ∓ 0.4	47	83.43	117.08	104.47
C122–1.1.2 × "	214.8 ∓ 5.8	114.6 ∓ 2.9	14.7 ∓ 0.3	42	83.39	116.48	103.92
C102–2.1.1 × "	205.2 ∓ 6.6	122.4 ∓ 3.9	14.5 ∓ 0.2	49	84.08	114.68	102.32
College White Flint	212.9 ∓ 5.0	113.2 ∓ 4.5	13.0 ∓ 0.3	45	84.01	112.12	100.00
C114–1.1.1 × Bicol	200.5 ∓ 5.6	86.8 ∓ 3.5	12.8 ∓ 0.4	44	82.60	111.68	99.64
Bicol White Flint	209.5 ∓ 5.8	110.5 ∓ 5.4	14.5 ∓ 0.3	46	82.36	109.98	98.09
C102–1.1.1 × Bicol	205.2 ∓ 4.6	100.2 ∓ 3.5	12.7 ∓ 0.2	49	85.62	109.92	98.04
C121–1.2.1 × "	198.0 ∓ 3.5	102.3 ∓ 3.9	13.9 ∓ 0.3	42	83.31	109.20	97.41
C113–1.2.1 × "	229.2 ∓ 2.5	113.3 ∓ 2.9	14.4 ∓ 0.3	44	84.52	108.92	97.15
C125–1.2.2 × "	195.6 ∓ 5.5	109.1 ∓ 5.7	14.5 ∓ 0.4	47	82.19	105.96	94.51
C111–1.4.1 × "	178.5 ∓ 8.4	89.1 ∓ 7.3	12.3 ∓ 0.3	50	86.31	96.92	86.46
Lagkitan	150.5 ∓ 6.2	87.2 ∓ 4.4	12.1 ∓ 0.2	48	83.21	83.68	74.63

L.S.M.D. = 18.202

[a] Two plants to a hill.

[b] Significantly better yielder than College White Flint.

AUROFAC AS A SUPPLEMENT TO THE COLLEGE GROWING RATION FOR CHICKS [1]

MARCELO V. CATALAN

WITH ONE TEXT FIGURE

The feeding value of the College growing mash was enhanced by the addition of ½ per cent level of Aurofac. In all trials, Aurofac increased consistently the weight of chicks. Mortality was greater in the control lot than in the Aurofac lot. As regards efficiency of feed utilization, the control lot required 5.62 kilograms to produce a kilogram gain in weight, and the experimental lot, only 4.21 kilograms.

In the past years the College growing ration for chicks has given satisfactory results. This ration, however, may still be improved by the addition of newly discovered dietary essentials which will further boost the growth, as well as reduce the mortality, of chicks during their early age. Aurofac [2] seems to be just the right supplement needed by the College growing ration to enhance its feeding value. Hence, this study was conducted in the Department of Animal Husbandry from December 8, 1952, to March 2, 1953, to observe the influence of Aurofac supplemented to the College growing ration.

REVIEW OF LITERATURE

Feeding experiments abroad using fermentation products containing vitamin B_{12} and certain antibiotics have shown very remarkable results. McGinnis (1949) of the Washington State Experiment Station demonstrated that the addition of APF [3] to chick diets already containing high percentages of fish meal gave further measurable increases in growth. Similarly, studies made at the Storrs Experiment Station by Singsen and Matterson (1949) showed that the addition of APF to a high-energy ration containing adequate amounts of animal proteins increased the weight of birds, at both

[1] Central Experiment Station Contribution No. 1668. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Instructor Amado C. Campos.

[2] Aurofac is a trade name for a vitamin B_{12}-antibiotic feed supplement (formerly called APF) commercially produced by the Lederle Laboratories Division of the American Cyanamid Company. It is guaranteed to contain not less than 1.8 grams of aureomycin and 1.8 milligrams of vitamin B_{12} to a pound. In addition it contains not less than 10 per cent crude proteins, 1 per cent crude fat, and not more than 7 per cent crude fiber.

[3] APF (Animal Protein Factor) is a commercial fermentation product which contains Vitamin B_{12} and certain antibiotics. The term APF was discarded from official use by the Association of American Feed Officials on October 4, 1950, and was replaced by the terms (1) Vitamin B_{12} Supplement and (2) Antibiotic Feed Supplement.

ten and twelve weeks of age, by one-third pound over those fed the same ration without APF supplement. Skinner, Quisenberry, and Couch (1951) similarly reported that efficiency of feed utilization among the chicks they experimented on was improved whenever APF concentrate was included in the ration.

Besides stimulating growth, APF has been shown by Bird, Rubin, Whitson, and Haynes (1946) and by Weise, Petersen, and Lampman (1949) to be effective in lowering the mortality rate of chicks during their first weeks of life. Likewise, Santos (1952) reported that in his study of growing rations containing varying amounts of animal and plant proteins supplemented with APF, the most striking result he obtained was the relatively low mortality of the chicks in all the lots.

MATERIALS AND METHODS

In this study, 168 New Hampshire chicks from the College flock were used in three trials simultaneously conducted for 12 weeks. Each trial consisted of a control and an experimental lot. An average of 28 chicks was used in each lot, or a total of 56 chicks in one trial. The chicks were wing-banded and weighed soon after they were removed from the incubator trays. Weighings were made every week thereafter until the end of the study. The chicks in both lots were raised in electrically heated battery brooders during their first eight weeks of life, but were later transferred to unheated cages where they remained until the end of the 12-week period.

To the first lot, designated the control lot, the College all-mash chick ration composed of the following ingredients, all parts by weight, was given throughout the entire period of the study:

Rice bran, fine	55	Fish meal	20
Ground corn	20	Copra meal	5

The same ration supplemented with 0.5 gram of Aurofac for every 1000 grams of the mash was given to lot II, the experimental lot. For uniform distribution of the supplement, Aurofac was first thoroughly mixed with a small amount of mash. More and more of the mash was gradually added to this mixture until the desired amount had been totally mixed. The whole process was done by hand.

The ration was given to both lots in dry form and, side by side with fresh drinking water, was made accessible to the birds at all times during the day. At the start of the fifth week of age of the chicks, ground shells and grit were made available to them *ad libitum*. In addition, finely chopped green feed, mostly ipil-ipil, *Leucaena glauca* Linn., was hand-fed to them daily. Except for the Aurofac supplementation in the ration given to lot II, practically identical treatment and care was given to the chicks of both lots.

The initial and weekly weights of the individual birds, the amount and cost of feed consumed, and the rate of mortality were recorded.

RESULTS AND DISCUSSION

Rate of growth. The rate of growth of the chicks in both lots, as indicated by their average weekly weights in the three trials, (table 1 and fig. 1) showed that the experimental birds were lighter than the control birds at the start, but at the end of the feeding period the former were much heavier than the latter. The weekly gains in weight of the birds in the experimental lot were also greater than those in the control lot from the beginning to the end of the 12-week period. If the final average weight of the birds were the only criterion of growth comparison and if the control lot were considered 100 per cent efficient, the experimental lot would be about 129.2 per cent as efficient. The difference of 29.2 per cent is decidedly an indication that the Aurofac-supplemented ration is superior to the control ration as far as rate of growth is concerned.

At the start of trial 1, the chicks in lot I were lighter by only 0.4 gram than those in lot II. The weight advantage of the experimental birds, however, was not only maintained but even increased greatly up to the end of the feeding period.

At the start of the second trial, the chicks in lot I were heavier than those in lot II by 1.1 grams. From the end of the first week up to the twelfth week, however, the chicks in lot II were heavier than those in Lot I.

In trial 3, the average initial weight of the chicks in lot I was heavier than in lot II by 0.2 gram. As in trials 1 and 2, from the end of the first to the end of the twelfth week, the chicks in lot II were consistently heavier than those in lot I.

The results of all the trials clearly indicate the superiority of the Aurofac-supplemented ration over the control ration in promoting the growth of chicks.

Amount and cost of feed consumed and returns above feed cost. The amount of feed consumed and the returns above feed cost (table 2) showed that on the average, the experimental chicks in each trial consumed more feed than the control chicks during the 12-week period, and they gained about 1⅔ times more in weight. Furthermore, the Aurofac birds required less feed than the control birds to produce a kilogram gain in weight. The actual returns above feed cost of the experimental lot amounted to more than twice the returns of the control lot. In returns above feed cost, therefore, Aurofac showed once more its importance in a growing ration.

Mortality. Another indication of the superiority of the Aurofac-supplemented ration over the control was the consistently lower death rate of the chicks in lot II in the three trials conducted (table 3).

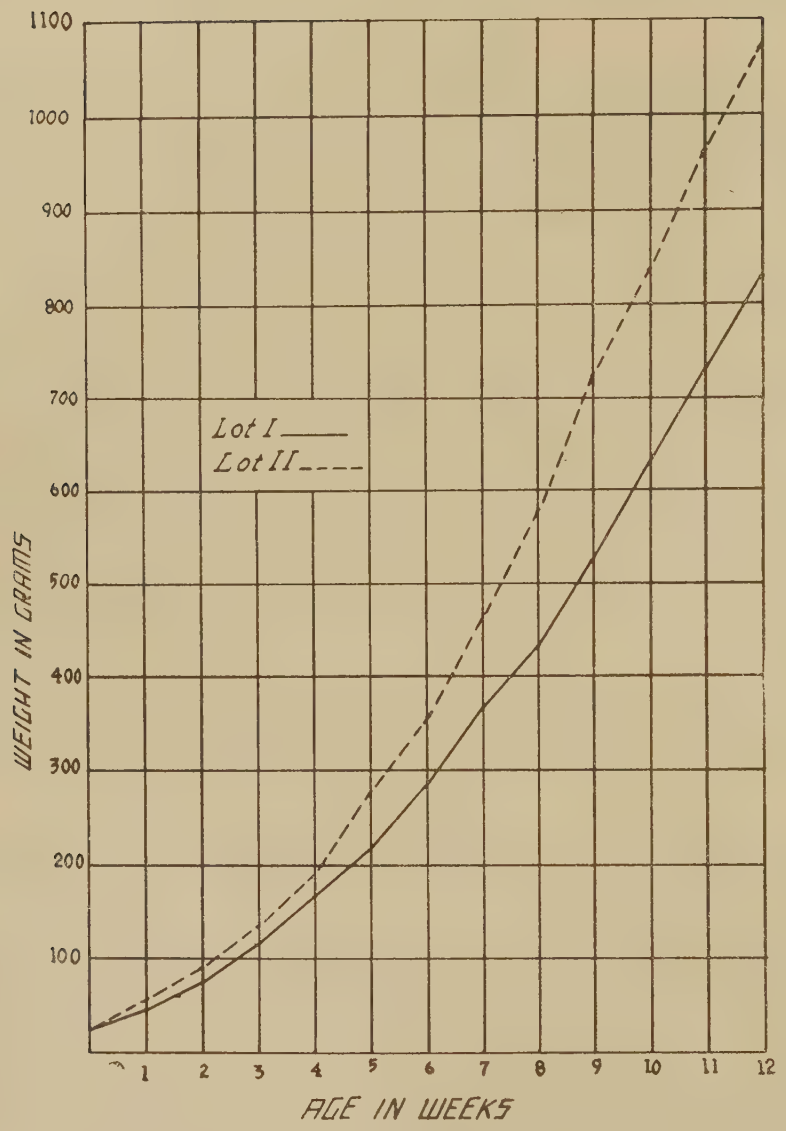

Fig. 1.—Average initial and weekly weights of New Hampshire chicks.

The greatest mortality for lots I and II occurred in trial 3. The smallest mortality for lot I was in trial 2. Death was due mostly to coccidiosis in the early part of the experiment and to roup in the latter part of the experiment.

In general, the results of the study tend to confirm the reports made by past workers about the mortality-inhibiting effect of vitamin B_{12}-antibiotic supplemented to rations for growing chicks.

LITERATURE CITED

BIRD, H. R., M. RUBIN, D. WHITSON, AND S. K. HAYNES. 1946. Effectiveness of dietary supplement in increasing hatchability of eggs and viability of progeny of hens fed a diet containing a high level of soybean oil meal. Poultry Sci. 25: 285–293.

MCGINNIS, JAMES. 1950. Vitamin B_{12} and a second growth factor (s) in A.P.F. supplement. Washington State College Nutrition Conference Proc.

SANTOS, JR., SEVERINO R. 1952. The influence of animal protein factor as a supplement to growing chick rations containing varying amounts of fish and mungo meals. Philippine Agriculturist 36: 83–89.

SINGSEN, E. P., AND L. D. MATTERSON. 1950. The effect of choline and Vitamin B_{12} concentrates on growth in the turkey poult. Poultry Sci. 29: 568.

SKINNER, J. L., J. H. QUISENBERRY, AND J. R. COUCH. 1951. High efficiency and APF concentrates in the ration of the laying fowl. Poultry Sci. 30: 319–324.

WEISE, A. C., C. F. PETERSEN, AND C. E. LAMPMAN. 1949. Activity of a microbial animal protein factor concentrate in a high energy broiler ration. Poultry Sci. 28: 752.

TABLE 1

Average weekly weight and total number of New Hampshire chicks in three trials

AGE	LOT I		LOT II	
	No. of birds	Weight	No. of birds	Weight
		grams		*grams*
1 day	84	37.9	84	37.6
1 week	78	54.4	81	57.6
2 weeks	74	78.6	79	88.7
3 weeks	71	119.5	79	135.9
4 weeks	70	164.0	79	192.6
5 weeks	70	218.8	79	282.1
6 weeks	68	286.2	79	353.4
7 weeks	67	368.6	79	467.2
8 weeks	66	440.1	79	577.1
9 weeks	66	536.1	79	721.7
10 weeks	63	637.1	79	841.3
11 weeks	60	740.6	78	961.2
12 weeks	60	833.3	78	1076.8

TABLE 2

Amount and cost of feed consumed and returns above feed cost

ITEM	LOT I				LOT II			
	Trial			Av.	Trial			Av.
	1	2	3		1	2	3	
Total amount of feed consumed, kilograms	94.40	103.00	66.10	87.83	120.60	114.40	106.00	113.66
Total cost of feed, pesos [a]	28.32	30.90	19.83	26.35	38.59	36.60	33.92	36.37
Total gain in weight of birds at 12 weeks of age, kilograms	16.49	18.86	11.47	15.60	29.05	28.63	23.13	26.93
Amount of feed consumed to produce a kilogram gain at 12 weeks of age	5.72	5.46	5.76	5.62	4.15	3.99	4.58	4.21
Cost of feed required to produce a kilogram gain, pesos	1.71	1.63	1.72	1.68	1.32	1.27	1.46	1.35
Weanlings produced, kilograms	17.55	19.93	12.52	16.66	30.12	29.68	24.19	27.99
Returns from sales of weanlings [b]	43.87	49.82	31.30	41.65	75.30	74.20	60.47	69.99
Actual returns above feed cost, pesos	15.55	18.92	11.47	15.31	36.71	37.60	26.55	33.62

[a] Cost of a kilogram of feed: Lot I, ₱0.30; Lot II, ₱0.32.
[b] Price of weanlings: ₱2.50 a kilogram.

TABLE 3

Percentages of mortality of New Hampshire chicks

ITEM	LOT I			LOT II			AVERAGE	
	Trial			Trial				
	1	2	3	1	2	3	Lot I	Lot II
No. of chicks at start	28	28	28	28	28	28	28	28
No. of weanlings at 12 weeks	21	23	16	27	27	24	20	26
No. of chicks that died	7	5	12	1	1	4	8	2
Percentage of mortality	25.0	17.9	42.9	3.6	3.6	14.3	28.6	7.1

THE MARKETING OF DUCK EGGS IN MORONG, PASIG, AND PATEROS, RIZAL [1]

NATHANIEL B. TABLANTE AND MELCHOR F. CONSTANTINO

The average number of duck eggs sold at each marketing by a farmer in Morong, Pasig, and Pateros, Rizal, represented about 41 per cent of the layers in the flock. Duck eggs were sold for cash by producers either to wholesalers or to retailers. On the average, 512 eggs at ₱14.12 a hundred were sold to Manila retailers at each marketing; 300 to *balut* makers at ₱13.00; 126 to local buyers at ₱12.18; and 104 to local retailers at ₱13.23. Eggs were marketed daily by 60.2 per cent of the producers; three times a week by 18.8 per cent; twice a week by 18.2 per cent; and weekly by 2.8 per cent. The larger the flock and the greater the number of eggs that could be marketed each time, the more frequent was the marketing period. The average number of eggs sold and the average price received by the producers varied from month to month. The variation in prices followed the law of supply and demand.

Producers would possibly get greater returns from the sale of their products if they had sufficient knowledge of market conditions, avoided competition among themselves, had adequate market facilities, paid more attention to sorting and grading of their products, and regulated the production and quantity of eggs marketed to avoid fluctuation in prices.

The ultimate benefits of marketing are reflected in better prices for the producers and in better quality of the products for the consumers. A knowledge of the factors affecting the marketing of a farm commodity would serve as a basis for improving the general set-up of the marketing system of that product.

Balmaceda [2] observed that the marketing methods practiced by the average farmer in the Philippines are haphazard, antiquated, and totally individualistic and that the present low economic position of the small producers can be attributed, to some extent, to their inability to market their products effectively.

Kinghorne [3] remarked that the care, handling, and promptness associated with the methods employed in marketing eggs have a decided effect upon the quality of the eggs, upon the satisfaction they afford the consumer, and upon the price generally paid to the producer.

In order to study the processes involved in the marketing of duck eggs in the province of Rizal and to determine the problems connected

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[1] Central Experiment Station Contribution No. 1684. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Agricultural Economics under the direction of the senior author.

[2] BALMACEDA, C. 1950. How to market your farm products. Agricultural and Industrial Life 12 (4): 6–7, 29.

[3] KINGHORNE, JOS. WM. 1947. Marketing eggs. U. S. Dept. Agric. Farmers' Bull. 1378: 1–40.

with it, the present investigation was done in the towns of Morong, Pasig, and Pateros from January to December, 1952.

METHOD OF STUDY

A survey was conducted to gather information regarding the economic aspects of marketing duck eggs, such as the quantity sold, market outlets used, methods of selling, and estimated expenses of marketing. A total of 181 duck raisers (103 in Pasig, 62 in Morong, and 16 in Pateros) was interviewed. These duck raisers had a total of 117,214 ducks, each flock ranging from 60 to 3000 birds.

Local buyers who purchased eggs from the operators surveyed were requested to supply information regarding the prices paid, marketing costs, and retail outlets. The processes involved in moving the product from the producers to the different buyers were observed in order to find out the problems connected with marketing. Retailers, local consumers, and *balut* makers were asked for additional information about the prices paid, source of supply, and retail outlets.

DISCUSSION OF RESULTS

Relation between size of flock and quantity of eggs marketed. There was a direct relationship between the size of flock kept and the number of eggs sold each marketing time (table 1). A flock generally included one drake for every ten layers, and on the basis of this proportion, the average number of eggs sold represented about 41 per cent of the number of layers in the flock.

Methods of selling. Duck eggs, frequently sold wholesale and sometimes at retail, were either absorbed locally or shipped to Manila and other places (table 2). Ninety-nine farmers, or more than one-half of those interviewed, sold their products to those who incubated the eggs for *balut*. The operators of the *balut* factories obtained the eggs from the producers daily, three times a week, twice a week, or weekly, depending upon their needs.

Sixty producers who did not have permanent customers, or about one-third of all the farmers interviewed, sold to local buyers who bought all available eggs and then either sold them to *balut* makers and retailers in the public market or took them to Manila and other neighboring towns. These buyers took care of transportation costs when they purchased at the point of production.

Of the 181 producers, 155 made transactions on a cash basis. The rest sold to *balut* makers on a contract basis, that is, they were obligated to deliver their eggs to the *balut* makers in return for cash advances given to them. Producers who sold their eggs on this basis generally received for their products prices a little lower than those prevailing at the time.

The frequency of marketing varied according to the number of eggs that could be sold each time; those with larger flocks marketed their eggs more frequently (table 3). Small operators reasoned that

they could sell their eggs only once a week because they had to accumulate a larger number; otherwise, they would find it difficult to find buyers.

Variation in prices and average quantity marketed. The average number of eggs sold and the average price received by the producers for a hundred eggs varied from month to month (table 4). The largest average quantity of 417 eggs marketed by each producer for each marketing was in March, and the smallest was in November.

Fronda [4] observed that in the markets of Los Baños and neighboring towns, there was a scarcity of hens' eggs from August to December which was not experienced during the first six or seven months of the year. He also observed a certain definite variation in the number of eggs produced at different times of the year. A similar situation prevails in the annual distribution of duck eggs in Morong, Pasig, and Pateros, Rizal. Normally, according to the duck raisers, the lowest production is in August, but in the towns surveyed in this study, it occurred in November. The two typhoons, Trix and Wilma, which passed Rizal province during the later part of October, 1952, might have greatly decreased the egg production in November. The duck operators believed that typhoons adversely influence the laying of ducks. Fronda [5] reported that hens tend to produce less eggs during the two or three weeks after a storm; within a month or so, however, the rate of egg production returns to normal. The farmers declared that under normal conditions, egg production is high in November.

The number of eggs that could be marketed at any one time was also affected by the availability of feed (snails), the frequency of marketing, and the kind of outlet used. Cabañgisan [6] stated that the availability of feed for ducks is a major factor towards a successful duck industry.

The highest average price was received in November, when the quantity marketed was lowest; the lowest price was obtained in March, when the supply was greatest. In December, the price was also high despite the relatively large supply because the demand for eggs during the Christmas season was perhaps greater than the existing supply, and price is directly proportional to the demand for any given product. Again, because of the increased demand for eggs during the Holy Week, the price became slightly higher in April than in the two months immediately preceding or following it. The price increased gradually beginning in July. The average price received by the producer for a hundred eggs also varied according to the kind of outlet used.

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[4] FRONDA, F. M. 1928. The seasonal distribution of egg production: the normal egg production curve. Philippine Agriculturist **17**: 25–33.

[5] FRONDA, F. M. 1935. Observations on the effect of some storms on egg production. Philippine Agriculturist **24**: 229–238.

[6] CABAÑGISAN, SOTERO T. A survey of the poultry industry of Rizal. (Thesis presented for graduation with the degree of Bachelor of Science in Agriculture, 1946. Unpublished.)

Problems of marketing. One of the most important problems of egg marketing in the towns visited was the lack of adequate knowledge of market conditions on the part of farmers and buyers. Being unaware of current prices, the producers usually disposed of their products at whatever prices the buyers offered.

Another problem was the need for sufficient marketing facilities. Storing and refrigerating facilities were entirely lacking so that the market area for duck eggs was rather limited. Proper handling and crating were also neglected. If facilities were available, overstocking of the product by retailers would be lessened, if not totally prevented, thereby reducing waste and spoilage in the stores.

The farmers' practice of selling their products individually resulted in competition among themselves. The producers frequently received low returns from the sale of their products because in their attempt to vie with one another, they weakened their bargaining power. Cooperative marketing may be suggested as a means of improving the lot of the small egg producers.

A fourth problem connected with the marketing of eggs was the lack of established standards for the commodity and the little attention that was given to sorting and grading. The duck raisers interviewed did not care about the quality of eggs they produced. As a result, they could not take advantage of better prices obtaining in the market for good-quality products.

A grading program would perhaps set higher prices for better grades. Poffenberger, De Vault, and Shaw [7] declared that the higher price which may be obtained for a high-quality product should be sufficient incentive for more producers to improve their methods of production and the quality of the eggs produced. These authors further stated that a producer who supplies the market with eggs of high quality will profit by a grading program and will receive larger returns when he sells his eggs on a graded basis than on a non-graded basis. A similar situation would probably be true in the Philippines. The government should establish definite grading standards in order to facilitate the transactions between producers and consumers.

A fifth problem was the fluctuation in quantities marketed and, consequently, in prices. Egg production is not constant throughout the year but varies from time to time and from season to season. Production is high during the dry season and low during the wet season. Throughout the molting season, which is from May to November, production is very low. The decrease in the supply of eggs is accompanied by a corresponding increase in price. If eggs were produced at a uniform rate throughout the year, the supply would be uniform and continuous (Kinghorne, 1947).[8] Hence, if demand were constant, prices would not fluctuate as much as they would otherwise.

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[7] POFFENBERGER, P. R., S. H. DE VAULT, and S. B. SHAW. 1938. Does it pay to grade eggs? Maryland Agric. Exper. Sta. Bull. 418: 279–308.

[8] KINGHORNE, J. M., *op. cit.*

TABLE 1

Average size of flock and number of eggs sold per marketing

SIZE OF FLOCK	FARMERS REPORTING		AVERAGE SIZE OF FLOCK	AVERAGE NUMBER OF EGGS SOLD BY EACH FARMER				
	Number	Percentage of total		Daily	Thrice a week	Twice a week	Weekly	All frequencies
No. of ducks			*No. of ducks*					
100 or less	12	6.6	90.4	45.0	54.0	28.4	6.0	33.1
100 to 200	22	12.2	159.9	98.5	75.3	41.3	20.0	80.3
201 to 300	24	13.3	279.1	120.5	86.0	100.8	70.0	105.6
301 to 400	18	9.9	370.6	150.9	99.6	95.0	—	123.4
401 to 500	21	11.6	457.6	195.8	112.8	89.3	—	158.9
501 to 600	16	8.8	569.9	217.2	210.0	120.0	—	183.1
601 to 700	19	10.5	685.5	305.2	183.0	280.0	—	286.4
701 to 800	13	7.2	786.2	203.3	319.0	350.0	—	216.8
801 to 900	9	5.0	855.6	299.7	150.0	275.5	—	307.0
901 to 1000	8	4.4	985.0	389.2	205.0	210.0	—	343.8
Over 1000	19	10.5	2190.0	915.4	550.0	310.0	—	774.7
All sizes	181	100.0	647.6	286.6	184.2	124.5	34.4	231.2

TABLE 2

Market outlets used, average quantity of eggs marketed, and average price received

MARKET OUTLET	FARMERS REPORTING		AVERAGE NUMBER OF EGGS SOLD BY EACH FARMER					AVERAGE PRICE RECEIVED PER HUNDRED EGGS
	Number	Percentage of total	Daily	Thrice a week	Twice a week	Weekly	All frequencies	
								pesos
Balut makers	99	54.7	335.4	264.4	174.5	—	299.9	13.00
Local buyers	60	33.1	146.0	125.0	90.5	11.0	126.3	12.18
Local retailers	13	7.2	176.6	72.4	37.3	—	104.4	13.23
Retailers in Manila and other places	9	5.0	1650.0	290.0	—	50.0	512.2	14.12
All outlets	181	100.0	286.6	184.2	124.5	34.4	231.2	12.80

TABLE 3

Relation between frequency of marketing and various factors

ITEM	FREQUENCY OF MARKETING				TOTAL
	Daily	Thrice a week	Twice a week	Weekly	
Number of farmers reporting ...	109	34	33	5	181
Percentage of total farmers reporting	60.2	18.8	18.2	2.8	100.0
Average number of ducks kept ..	741.6	606.0	451.4	175.4	647.6
Average number of eggs sold by each producer at each marketing	286.6	184.2	124.5	34.4	231.2
Average receipts from each marketing, pesos	35.94	23.98	17.39	4.05	29.59

TABLE 4

Monthly variation in quantity sold per marketing and in average price received for 100 eggs

MONTH	AVERAGE NUMBER OF EGGS SOLD BY EACH FARMER					AVERAGE PRICE RECEIVED PER HUNDRED EGGS
	Daily	Thrice a week	Twice a week	Weekly	All frequencies	
						pesos
January	240.0	181.0	—	—	228.2	12.02
February	328.8	64.0	45.0	—	259.4	11.38
March	462.8	75.0	—	—	417.2	11.16
April	161.3	353.3	42.5	—	181.2	12.05
May	397.0	—	310.0	—	382.5	11.57
June	271.1	132.0	100.0	25.5	182.7	11.44
July	213.3	231.4	—	—	220.3	12.37
August	198.6	122.0	104.4	70.0	139.9	13.42
September	175.8	71.5	147.6	—	148.7	13.94
October	286.0	282.5	156.7	—	252.5	15.75
November	169.3	—	41.7	—	105.5	17.42
December	439.0	207.5	207.5	—	323.3	16.43
Total	3343.0	1720.2	1155.4	95.5	2841.4	159.45
Monthly average	278.6	172.0	128.4	47.8	236.8	—
Weighted average	—	—	—	—	—	13.01

HEART RATE, RESPIRATION, AND BODY TEMPERATURE OF BERKJALA SWINE [1]

FAUSTINO S. MENSALVAS AND MIGUEL P. PALAO

The heart rate and frequency of respiration, but not the body temperature, of ten apparently healthy, six-month-old Berkjala swine were very much higher than those reported in foreign countries. The mean heart rate of the five gilts was 109.34 ± 1.11 beats a minute; the mean respiratory rate, 30.53 ± 0.62 times a minute; and the mean body temperature, 102.44 ± 0.08°F. (39.07°C.). The mean heart rate of the five barrows was 107.20 ± 1.26 beats a minute; the mean respiratory rate, 32.25 ± 0.50 times a minute; and the mean body temperature, 102.92 ± 0.2°F. (39.90°C.). Both sexes had a mean heart rate of 108.29 ± 0.20 beats a minute, a mean respiratory rate of 31.39 ± 0.42 times a minute, and a mean body temperature of 102.68 ± 0.05°F. (38.96°C.).

Seasonal fluctuation affected the foregoing physiological manifestations of the animals. During the dry season both sexes had a mean heart rate of 109.62 ± 0.42 beats a minute, a mean respiratory rate of 26.44 ± 0.72 times a minute, and a mean body temperature of 102.81 ± 0.11°F. (39.21°C.); during the wet season they had a mean body temperature of 102.62 ± 0.05°F. (39.19°C.), a mean heart rate of 107.48 ± 1.43, and a mean respiratory rate of 33.89 ± 0.48.

Local data on the heart rate, respiration, and body temperature of Berkjala swine are lacking. Because of the need for such data for clinical purposes, these three physiological manifestations and their seasonal variations, if any, were studied in the Department of Animal Husbandry from January to December, 1952.

Reports on the body temperature, heart rate, and frequency of respiration of the hog vary. The normal body temperature of this animal, according to Udall (1922), ranges from 99.5 to 101.0°F. (37.5 to 38.5°C.), with an average of 100.4°F. (38.0°C.); its normal heart rate is 60 to 80 beats a minute; and its normal frequency of respiration is 8 to 18 times a minute. Its approximate normal body temperature, as reported by Hadley (1939), is 102.6°F. (39.2°C.), whereas the range of its normal heart rate is 70 to 80 beats a minute, and that of its normal respiratory rate is 10 to 15 times a minute. Malkmus (1944) reported 100.4 to 104.0°F. (38.0 to 40.0°C.) as the normal body temperature of a hog, 60 to 100 beats a minute as the normal heart rate, and 10 to 15 times a minute as the normal frequency of respiration. According to Palmer, as cited by Dukes (1947), the normal body temperature of the hog ranges from 101.6 to 103.6°F. (38.7 to 39.8°C.), with an average of 102.5°F. (39.2°C.). The findings of Dukes (1947) on the range of normal heart and respiratory rates a minute of the hog are similar to those

[1] Central Experiment Station Contribution No. 1685. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of the senior author.

reported by Udall (1922). According to Hobdy, as cited by Smith (1921), the normal body temperature of this animal ranges from 101.5 to 105.5°F. Rubio [2] reported its heart rate as ranging from 60 to 145 beats a minute, its respiratory rate, from 11 to 47 times a minute, and its body temperature, from 37.8 to 41.3°C. Villegas (1952) stated that the mean body temperature of Berkjala sows is 102.7 ± 0.89°F. (39.24°C.).

MATERIALS AND METHODS

Ten apparently healthy, six-month-old Berkjala swine (five gilts and five barrows), belonging to the College of Agriculture, were used in this study. Before the experiment all the animals were accustomed to the different instruments used. They were given identical feed, care, and management during the study and were allowed free access to pasture and water at all times.

The heart and respiratory rates and body temperature were taken on the first and third weeks of each month between 8:00 and 12:00 o'clock in the morning. The heart rate was taken by direct auscultation with a stethoscope placed on the chest of the animal behind the elbow. Because of the difficulty of taking a full-minute count, three counts of ten seconds each were made and the average was multiplied by six to represent the heart rate a minute. The rise and fall of the flanks was used as a guide in counting the frequency of respiration. Three counts of a full minute each were made and the average was taken as the frequency of respiration a minute. In determining the body temperature, a veterinary clinical thermometer, graduated from 94 to 110°F. and accurate to 0.2°F., was inserted full length into the rectum of the animal for at least three minutes.

Based on the amount of rainfall recorded by the Weather Observation Division of the Department of Agricultural Engineering, the period from January to April was considered the dry season, and that from May to December, the wet season. The monthly rainfall in millimeters for 1952 was as follows:

January	52.0
February	40.2
March	22.4
April	9.5
May	133.4
June	242.7
July	—
August	455.5
September	189.7
October	540.1
November	80.9
December	239.9

[2] RUBIO, P. C. A study on the pulse and respiration rates and body temperature of Philippine pigs. (Thesis presented in 1951 to the faculty of the College of Veterinary Medicine, University of the Philippines, in partial fulfillment of the requirement for the degree of Doctor of Veterinary Medicine. Unpublished.)

RESULTS AND DISCUSSION

Heart rate. The minimum heart rate of the gilts was recorded in October, whereas that of the barrows was in May (table 1). The maximum heart rate for both the gilts and the barrows was observed in March. The slight dissimilarity in mean heart rate between the gilts and the barrows may be attributed to sex difference. The range for both sexes is very much wider than that found by Malkmus (1944) but almost similar to that reported by Rubio.[3]

Respiratory rate. The slightly higher mean respiratory rate of the barrows (table 2) may be due to the development of more fatty tissues in barrows than in gilts. The thick fat covering in barrows reduces heat radiation and conduction, so that the animals, in order to maintain their normal body temperature, respire at a faster rate. The slowest rate of respiration for the gilts was recorded in February, and for the barrows, in January, February, April, and May; the fastest rate for the gilts was in May and for the barrows, in December. The range for both gilts and barrows was from 16 to 54 times a minute, with a mean of 31.39 $\pm$ 0.42 a minute. This is markedly higher than those reported by foreign authors and slightly higher than that reported by Rubio.[4]

Body temperature. The slightly lower body temperature of the gilts (table 3) as compared to that of the barrows was due to the pregnancy of the gilts from July to October. The body temperatures of both sexes, while slightly lower than those found by Rubio,[5] are almost the same as those reported by Villegas (1952), and they fall within the range of normal body temperature reported in temperate countries.

Effect of season. The season affected the heart and respiratory rates and body temperature of the animals (table 4). The mean heart rates a minute of the gilts and the barrows were slightly higher during the dry season than during the wet season. Unlike the heart rates, the respiratory rates of gilts and barrows were higher during the wet season than during the dry season. The higher respiratory rates during the wet season may be attributed to pregnancy, in the case of the gilts, and to more fatty tissues, in the case of the barrows, which had already grown fatter by that time. Of the three physiological manifestations studied, body temperature was least affected by season. The mean body temperature of the gilts was slightly higher during the dry season than during the wet season; the reverse was true of the barrows.

Other observations. Vaccination with swine plague vaccine on October 7, 1952, and with hog cholera vaccine on October 17 slightly increased the mean heart and respiratory rates of the barrows. These vaccinations did not have any effect on the body temperatures of both sexes.

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[3] *Ibid.*
[4] *Ibid.*
[5] *Ibid.*

LITERATURE CITED

DUKES, H. 1947. The physiology of domestic animals. 6th ed., 795 p. Ithaca, New York: Comstock Publishing Company, Inc.

HADLEY, F. B. 1939. Principles of veterinary science. 3rd ed., 594 p. Philadelphia and London: W. B. Sanders Company.

MALKMUS, B. 1944. Clinical diagnostics of the internal diseases of domestic animals. 11th ed., 302 p. Chicago: Alex Eger, Inc.

SMITH, E. 1921. A manual of veterinary physiology. 5th ed., xv + 892 p., 273 fig. Chicago: Alex Eger, Inc.

UDALL, D. H. 1922. Veterinarian's handbook of materia medica and therapeutics. 2nd ed., 180 p. New York: The Macmillan Company.

VILLEGAS, V. 1952. The shortest time for obtaining body temperature of animals. Philippine Agriculturist 35: 441–443.

TABLE 1

Heart rates a minute of Berkjala gilts and barrows

MONTH	GILTS			BARROWS		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean
January	92.00	132.00	114.97 ± 4.53	88.00	142.00	113.85 ± 5.17
February	96.00	122.00	108.58 ± 2.88	78.00	128.00	108.19 ± 4.99
March	96.00	140.00	108.99 ± 4.86	78.00	146.00	107.79 ± 7.16
April	88.00	132.00	110.38 ± 4.39	84.00	128.00	106.18 ± 4.95
May	84.00	126.00	101.58 ± 5.11	64.00	128.00	101.99 ± 6.10
June	92.00	139.00	105.32 ± 4.81	74.00	144.00	107.98 ± 6.30
July	96.00	130.00	109.99 ± 1.29	88.00	138.00	106.59 ± 4.06
August	84.00	132.00	112.29 ± 4.55	94.00	116.00	103.78 ± 2.14
September ...	96.00	118.00	107.38 ± 2.54	96.00	118.00	100.79 ± 3.00
October	80.00	121.00	108.50 ± 5.17	90.00	134.00	113.19 ± 3.78
November ...	84.00	128.00	107.58 ± 4.40	90.00	144.00	108.99 ± 5.06
December ...	108.00	128.00	116.59 ± 2.46	94.00	122.00	107.18 ± 2.79
Mean	—	—	109.34 ± 1.11	—	—	107.20 ± 1.26

TABLE 2

Respiratory rates a minute of Berkjala gilts and barrows

	GILTS			BARROWS		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean
January	19.00	33.00	29.93 ± 1.52	19.00	38.00	27.00 ± 1.89
February	15.00	33.00	24.20 ± 1.43	19.00	38.00	27.00 ± 1.65
March	16.00	47.00	29.03 ± 4.00	21.00	41.00	29.26 ± 2.11
April	21.00	37.00	25.43 ± 1.60	19.00	40.00	26.73 ± 1.49
May	18.00	54.00	39.96 ± 3.30	19.00	41.00	32.00 ± 2.54
June	21.00	49.00	31.03 ± 2.80	35.00	45.00	38.23 ± 1.06
July	29.00	41.00	33.80 ± 1.29	29.00	42.00	34.77 ± 1.80
August	23.00	37.00	28.66 ± 1.09	26.00	31.00	29.80 ± 0.40
September ...	25.00	39.00	29.90 ± 1.41	25.00	36.00	32.40 ± 1.10
October	20.00	46.00	30.06 ± 3.23	38.00	45.00	41.80 ± 0.95
November ...	24.00	43.00	33.70 ± 2.61	24.00	43.00	32.67 ± 1.75
December ...	32.00	41.00	37.60 ± 0.92	27.00	47.00	35.43 ± 2.84
Mean	—	—	30.53 ± 0.62	—	—	32.25 ± 0.50

TABLE 3

Body temperatures of Berkjala gilts and barrows

MONTH	GILTS			BARROWS		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean
	°F.	°F.	°F.	°F.	°F.	°F.
January	102.2	104.0	103.00 ± 0.02	101.6	103.3	102.90 ± 0.50
February	102.00	104.0	103.00 ± 0.17	101.6	103.5	102.46 ± 0.59
March	101.9	103.4	102.82 ± 0.30	101.6	104.9	102.89 ± 1.53
April	101.4	103.2	102.46 ± 0.18	102.1	105.0	102.97 ± 1.48
May	101.4	104.2	102.38 ± 0.38	101.6	104.2	102.64 ± 0.03
June	100.6	104.6	102.49 ± 0.46	101.7	105.5	103.05 ± 0.39
July	100.2	104.5	102.20 ± 0.42*	101.4	104.2	102.63 ± 0.29
August	100.7	103.8	101.90 ± 0.40*	101.9	104.2	103.00 ± 0.24
September	100.0	103.9	101.45 ± 0.46*	102.8	104.6	103.52 ± 0.17
October	99.5	105.4	102.33 ± 0.47*	102.1	104.2	102.89 ± 0.26
November	100.8	104.6	102.76 ± 0.34	100.8	104.9	103.01 ± 0.40
December	101.2	104.0	102.49 ± 0.30	102.8	104.8	103.10 ± 0.25
Mean	—	—	102.44 ± 0.08	—	—	102.92 ± 0.09

* The gilts were pregnant.

TABLE 4

Heart rate, respiratory rate, and body temperature of Berkjala gilts and barrows in relation to season

SEASON AND MONTH	HEART RATE A MINUTE		RESPIRATORY RATE A MINUTE		BODY TEMPERATURE	
	Gilts	Barrows	Gilts	Barrows	Gilts	Barrows
					°F.	°F.
Dry:						
January	114.97 ± 4.53	113.85 ± 5.17	29.93 ± 1.52	27.00 ± 1.89	103.00 ± 0.02	102.90 ± 0.50
February	108.58 ± 2.88	108.19 ± 4.99	24.20 ± 1.43	27.00 ± 1.65	103.00 ± 0.17	102.46 ± 0.59
March	108.99 ± 4.86	107.79 ± 7.16	29.03 ± 4.00	29.26 ± 2.11	102.82 ± 0.30	102.89 ± 1.53
April	110.38 ± 4.39	106.18 ± 4.95	25.43 ± 1.60	26.73 ± 1.49	102.46 ± 0.18	102.97 ± 1.48
Mean	110.73 ± 2.10	109.01 ± 2.37	25.40 ± 1.15	27.47 ± 0.89	102.82 ± 0.09	102.81 ± 0.15
Wet:						
May	101.58 ± 5.11	101.99 ± 6.10	36.96 ± 3.30	32.00 ± 2.54	102.38 ± 0.30	102.64 ± 0.03
June	105.32 ± 4.81	107.98 ± 6.30	31.03 ± 2.80	38.23 ± 1.06	102.49 ± 0.46	103.05 ± 0.39
July	109.99 ± 1.29	106.59 ± 4.06	33.80 ± 1.29	34.77 ± 1.80	102.20 ± 0.42	102.63 ± 0.29
August	112.29 ± 4.55	103.78 ± 2.14	28.66 ± 1.09	29.80 ± 0.40	101.90 ± 0.40	103.00 ± 0.24
September ...	107.38 ± 2.54	100.79 ± 1.41	29.90 ± 1.41	32.40 ± 1.10	101.45 ± 0.46	103.52 ± 0.17
October	108.50 ± 5.17	113.19 ± 3.78	30.06 ± 3.23	41.80 ± 0.95	102.33 ± 0.47	102.89 ± 0.26
November	107.58 ± 4.40	108.99 ± 5.06	33.70 ± 2.61	32.67 ± 1.75	102.76 ± 0.34	103.01 ± 0.40
December	116.59 ± 2.46	107.18 ± 2.79	37.60 ± 0.92	35.43 ± 2.84	102.49 ± 0.30	103.10 ± 0.25
Mean	108.66 ± 1.37	106.31 ± 1.49	33.13 ± 0.94	34.64 ± 0.61	102.22 ± 0.03	102.98 ± 0.09

CONSUMER PREFERENCES AND RETAIL PURCHASES OF POULTRY AND EGGS OF 300 HOUSEHOLDS IN NAGA CITY [1]

NATHANIEL B. TABLANTE AND CORAZON P. SALAMAT

The 300 housewives surveyed in Naga City generally preferred locally produced, fresh, large-sized, white-shelled eggs. Chicken and duck (Mallard) eggs were commonly purchased, but chicken eggs were used by more consumers. Consumers preferred the native breed of chicken and the heavy or large-sized female birds. The preference was for pullets and fryers and for white-skinned chickens, whether of native or imported breed. Eighty-seven per cent of the households would rather buy live birds than other forms. Ducks, turkeys, and squabs were not generally purchased.

Chickens and eggs were usually purchased from the public market singly once a week or when they were needed. The average weekly consumption of a household with an average of 7.8 members was 11 chicken eggs and eight duck eggs. The average consumption of chickens was four a month.

A logical approach to an understanding of marketing is to study the consumer, to learn what he wants and what he can or will pay for the goods he chooses. The producers should understand the demands of the actual and prospective users of their products in order that they may modify existing products, change price and marketing policies, and ultimately make their business ventures successful from the standpoint of greater returns for themselves and greater satisfaction of the consumers.

Lippincott and Card,[2] in a survey of 11,443 housewives in Chicago, reported that nearly one-third of the persons interviewed had no preference for either white or brown shells of eggs. Those in the suburban territory who expressed preferences were about equally divided between white and brown shells. In the city proper, however, 45 per cent of those interviewed expressed preference for white-shelled eggs, presumably because white coloring is associated with good interior quality. These authors concluded that purchasers of eggs are first of all concerned with interior quality and that the color of the shell is of little importance, except as it has come to be associated with a particular quality as a result of experience.

The same authors also reported that the results of a study based on personal visits to nearly 600 housewives in Providence, Rhode Island, in 1928 and in 1932 showed that a larger percentage of persons who expressed preference for shell color was for brown eggs than for white. They concluded that while there is no relation be-

[1] Central Experiment Station Contribution No. 1686. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Agricultural Economics under the direction of the senior author.

[2] LIPPINCOTT, W. W., AND L. E. CARD. 1946. Poultry production. 7th ed., 440 p., 236 fig. Philadelphia: Lea and Febiger.

tween shell color and interior quality, enough color preference exists in certain markets to warrant consideration by shippers. They further reported that New York City has long been known as a white-egg market. Boston, on the other hand, has long been regarded as a brown-egg market.

As cited by de la Torre, Tablante, and Fronda (1950), Cron, Burdette, and DeVault,[3] in a study of 700 white families and 175 Negro families in Baltimore, Maryland, reported that the annual per capita consumption of eggs was 28.2 dozens for white families with an average size of 4.13 persons and 17.53 dozens for Negro families with an average size of 4.2 persons. They also found that one-third of the families surveyed preferred white-shelled eggs. Negro families had a distinct preference for brown-shelled eggs. Large eggs were more preferred than medium-sized ones. Eggs were kept in iceboxes and refrigerators and were bought from farmers and hucksters, since freshness and quality of eggs from these sources were assured.

De la Torre, Tablante, and Fronda,[4] in a study of the preferences of 2518 households in Manila for poultry and poultry products, concluded that size of income and size of household do not affect very much consumers' preferences for freshness, color of shell, and size of eggs and color of skin, size, sex, age, and forms of poultry.

Del Fierro,[5] in a study of live poultry sold in three principal markets of Manila, reported that the prices of poultry varied in the different markets and according to size, sex, and kind.

METHOD OF STUDY

A survey was made of the preferences and the retail purchases of different kinds of poultry and eggs of 300 households in Naga City. A questionnaire prepared in the College of Agriculture was used in gathering the data. The households interviewed were in various sections of the city. Different levels of income were represented in the various locations.

The housewives, who generally buy the foodstuff for the households, were asked to indicate the kinds of eggs and poultry preferred by their families, the quantity purchased, the frequency of purchase, and the source. From the information the consumption was calculated. Some retailers and merchants were interviewed to obtain general information on preferences, quantities commonly sold, and prices.

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[3] Cron, L. E., R. F. Burdette, and S. H. DeVault. 1939. Economic analysis of the Baltimore egg market. Maryland Agric. Exper. Sta. Bull. 430: 1–163. *Cited in* The Philippine Agriculturist 34: 78–83. 1950.

[4] Torre, Quintin L. de la, N. B. Tablante, and F. M. Fronda. 1950. A study of consumers' preferences in the city of Manila for poultry and poultry products. Philippine Agriculturist 34: 78–83.

[5] Fierro, Jr., Vito del. 1952. The live poultry and egg markets of Manila after World War II. Philippine Agriculturist 36: 131–139.

The study was made from January, 1952, to March, 1953. The survey was conducted in Naga City during the summer of 1952.

RESULTS AND DISCUSSION

Description of the households surveyed. The 300 household units covered in this study consisted of 2348 individuals, or an average of 7.8 persons to a household. The heads of these households were engaged in all sorts of occupations, both professional and non-professional. There were 62 laborers, 34 storekeepers, 19 tailors, 21 drivers, 56 teachers, 39 farmers, 24 businessmen, and 46 office employees.

The average gross annual income of the 300 households was ₱3579. There were 109 households with gross annual incomes of less than ₱2000; the average income of these households was ₱1380. There were 122 households with incomes from ₱2000 to ₱5999, or an average of ₱3348. Sixty-nine households reported gross incomes of more than ₱6000 a year; the incomes of these households averaged ₱7462.

General preferences for eggs. More than 41 per cent of the households surveyed indicated preference for both chicken and duck (Mallard) eggs, and 35 per cent, for chicken eggs only. Whether for chicken eggs or duck eggs, the choice of a large majority of the housewives was for fresh, locally produced eggs. *Balut* and salted duck eggs were not so common in this city, as only 20 per cent and 15 per cent, respectively, indicated their choice for such eggs. Imported eggs, which were also quite uncommon in the place, were preferred by only 25 households. Twenty-eight per cent of the 300 households did not discriminate between local and imported eggs.

As to size of eggs, 188 families, or about 63 per cent, preferred the large ones; 104, or more than one-third, the medium-sized; and only eight, or about 3 per cent, had no preference. None preferred the extra-large or the small sizes.

White-shelled chicken eggs were the choice of more than four-fifths of the persons interviewed; 42, or 14 per cent, however, were not particular about the color of the shell.

Buying practices and weekly consumption of eggs. Eggs were mostly purchased once a week by the housewives. The most common unit of purchase was by the piece, especially among the low-income families; the higher-income groups tended to buy eggs by the dozen. Housewives purchased eggs daily, monthly, or only occasionally, with the high-income groups tending to make more frequent purchases. The frequency of purchase depended upon the need for eggs, availability of storage facilities at home, and purchasing power of the consumers. The public market was the most common source of eggs, although poultry raisers and local variety stores also supplied some of the families.

Fifty-two per cent of the families reported the use of six to ten chicken eggs a week, and 55 per cent reported the same number for duck eggs. The average number of chicken eggs used by all the households a week, however, was eleven, and that of duck eggs, eight.

General preferences for chickens. Native female chickens were preferred by many of the housewives studied. Foreign breeds of chicken, which are not very common in Naga City, were preferred by only 20 per cent.

Pullets were the choice of more than one-half of the consumers interviewed, and fryers, of 40 per cent. Five per cent did not have any preference as to the class of chicken they purchased.

As to weight of chickens, 54 per cent of the consumers chose the heavy ones. Some 39 per cent chose the medium-sized birds, and only a few would buy any size.

Whether of the foreign or local breeds, most of the housewives selected white-skinned fowls; 240, or 80 per cent, however, did not indicate preference for any color of skin of foreign breeds of chicken.

Buying practices and monthly consumption of chickens. Eighty-seven per cent of the households studied would rather buy live birds than other forms. Of the rest, only a few wanted locally dressed fowls, or frozen forms, and 7.34 per cent registered no preference. Chickens were mostly purchased by the piece, once a week, from the public market. Retail stores and raisers were also sources of chickens of some housewives.

The average monthly consumption of chickens by a household was four. Some, especially the high-income families, bought more a month.

General preferences for ducks. Only 56 of the 300 households studied were consumers of duck meat; 244 did not buy this kind of poultry. Among those who purchased ducks, the preference was for the Mallard breed, for young females, and for live birds.

Among the duck-meat consumers, the general practice was to purchase ducks by the piece occasionally. The most common source of ducks consumed was the duck raisers, although some consumers bought their ducks at the public market.

General preferences for other poultry. Turkeys and pigeons were the least preferred of the different kinds of poultry. Ninety-six per cent of the total number of households did not purchase turkey, and about 92 per cent were not pigeon consumers. These kinds of poultry were purchased occasionally, and the general practice was to buy by the piece. The principal source of turkey was the raisers, and of pigeon, persons other than the raisers in the public market.

Home-storage facilities. Of the 300 households studied, more than one-half were provided with cages and coops in which to keep live birds. A large number had miscellaneous types of storage facilities. Iceboxes and refrigerators were not common; only a few households in the high-income groups had them.

COLLEGE AND ALUMNI NOTES

As part of their services under the contract for technical assistance between Cornell University and the College of Agriculture of the University of the Philippines, five members of the advance team of agricultural experts from Cornell University are holding classes in their special fields in the second semester of the school year 1952-1953.

The Project Leader of the group and Professor of Agricultural Administration and Extension, M. E. Robinson, lectures in the Department of Agricultural Education on methods of extension teaching.

Professor C. A. Bratton teaches, in the Department of Agricultural Economics, a course on the methods and functions of marketing farm products and another on the history, development, and mechanism of rural credit.

Professor A. M. Goodman handles a course on irrigation, drainage, and farm structures in the Department of Agricultural Engineering.

Professor H. K. Hayes is giving a course in advanced methods of plant breeding in the Department of Agronomy.

Professor G. C. Kent conducts a weekly seminar in the Department of Plant Pathology and leads a round-table discussion of recent advances in plant pathology, with particular emphasis on terminology, epidemiology, and disease forecasting. He is particularly interested in diseases of rice and corn, and his students expect to work with the Department of Agronomy on the breeding of rice and corn resistant to diseases.

Mrs. Esther C. Bratton is Professorial Lecturer of Agricultural Education.

U. S. Ambassador Raymond Spruance visited the College on October 15, 1952. With him were Mr. Jack R. Johnston, agricultural attaché, Mr. Ray G. Johnson, Prof. M. E. Robinson, and Dean L. E. Call. The party arrived at 9:30 in the morning. After an informal reception at the Dean's office, the Ambassador and his party proceeded to the agronomy compound where they discussed coffee and spice production and processing with Dr. P. A. David and plant crops with Dr. V. C. Calma. They then proceeded to the farm machinery laboratory, the infirmary, the poultry and animal husbandry projects, the College farm, and the new constructions under the PHILCUSA-MSA program. Lunch was served at the H. E. laboratory in the Rural High School. After lunch, the party visited the Cornell housing and the College of Forestry. They left at 3:00 o'clock in the afternoon.

Ambassador Spruance expressed in a letter his gratefulness to the Dean and all faculty members who helped make his visit a pleasant and instructive one. He made particular mention of the luncheon, where he became familiar with a number of vegetables and tropical fruits previously unknown to him, and the very interesting explanations and discussions pertaining to the work in this College. In another letter to the Dean, Mr. Ray G. Johnson also expressed appreciation and thanks for the attention and efforts given in connection with the visit of Ambassador Spruance.

Mr. C. Tyler Wood, deputy chief of the MSA, Washington, D.C., visited the College on November 6, 1952. With him were other members of his staff: Theodore Tannenwald, Jr., James Pomeroy Hendrick, and Frank C. Colcord, Jr. A luncheon in their honor was served at the H. E. laboratory, Rural High School.

The visitors were accompanied by Dr. Roland R. Renne, chief of the local MSA, and Mr. Ray G. Johnson, chief of the agricultural division, MSA.

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KENT, G. C., Plant Pathology (Cornell)
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ROBINSON, M. E., Project Leader; Agricultural Administration and Extension (Cornell)
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